The Effects of Sun-Blocks and Sun-Screens in Preventing the Penetration of UV Waves

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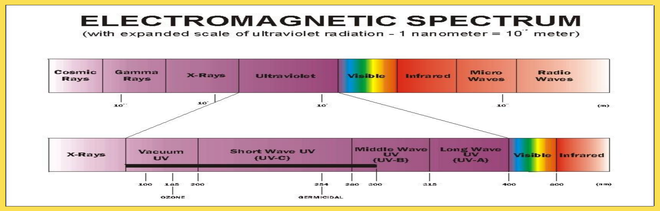
ABSTRACT

What effect do sunscreens and sunblocks have on stopping those penetrating summer solar rays? Using UV probes and data loggers, we looked at the amount of ultraviolet waves that penetrated through polypropylene dishes and glass dishes treated with o.3 g of various sun protective products. Suncreens and sunblocks allowed UV radiation between 16-37 mW/m2 while untreated dishes detected radiation between 65-154 mW/m2 to pass through. Plastic dishes did block UV better than glass, for the most part. This study has opened up a multitude of avenues for further study in ultraviolet transmissivity.

RESEARCH QUESTION

What is the effect of using sunscreens to decrease the amount of ultraviolet radiation that passes through a clear plastic or glass dish?

BACKGROUND



Ultraviolet radiation is part of the electromagnetic spectrum along with radio waves, microwaves, and visible light. There are three major UV waves. UVC waves (wavelengths shorter than 280nm) are almost completely absorbed by the ozone in our atmosphere. UVB (280-320 nm) makes it through the atmosphere and is thought to be responsible for sunburn, cataracts, and skin cancer. UVA (320-400 NM) is less damaging to the skin initially, but may cause delayed damage to the skin and eyes.

Today's sunscreens and sunblocks claim that they can lessen the damage from UVA and UVB waves by containing various SPF values. The SPF, sun protection factor, measures the length of time a product protects against skin reddening from UVB, compared to how long the skin takes to get red without protection. If it takes 20 minutes for skin reddening without protection, then after using an SPF 15 sunscreen it would take 15 times longer for reddening to occur or about 300 minutes. To maintain the same protection, then, sunscreen would need to be reapplied every five hours.

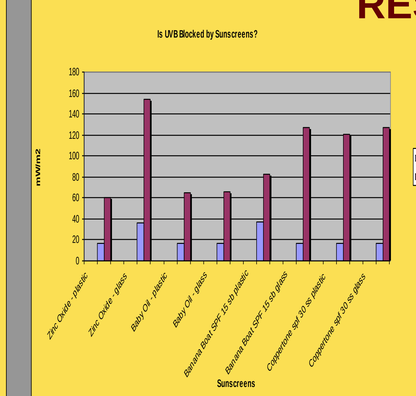
METHODS

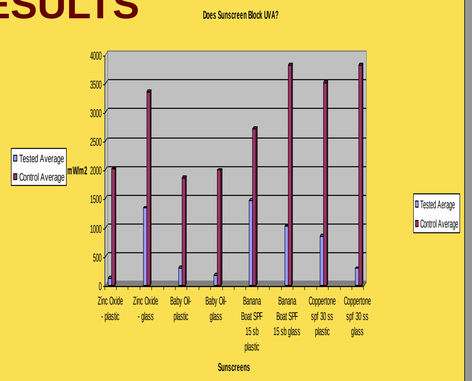
Materials:
CR10X Data Logger and Climate Probes
Vernier LabPro with UVA and UVB Probes
Polystyrene and Pyrex Petri dishes (8.5 – 9 cm)
Ring stand for measurements.
Sunscreens: Baby Oil, Coppertone Spray SPF 30, Fruit of the Earth Lotion SPF 45, HyVee SPF 45 for babies, Ocean Potion Dab-On SPF 60.
Sunsblocks: Zinc Oxide 20%, Banana Boat Lotion, SPF 15, Target Lotion SPF 30.

The CR10X Data Logger was programmed to record heat flux, barometric pressure, temperature, net radiation, solar radiation, and relative humidity. The apparatus and logger were taken to the Penthouse floor of Science II on the Iowa State University campus to capture data for several days.

The Vernier DataPro was programmed to sample the UVA and UVB rays six times each minute. The experimental unit for each trial consisted of two polystyrene dishes and two glass dishes. Each dish was numbered and divided into four quadrants, A through D. The mass was found for each dish. Then each clean dish was taken to the Penthouse and UV readings were taken for a control. Sun products were applied in the amounts of 0.3 g and 0.1 g. Again the dishes were taken to the Penthouse and UV readings were taken. The readings for the experimental data and the controls were matched to the dishes.

RESULTS





Sunscreens and sunblocks were found to decrease the penetration of UVB and UVA transmissions through plastic and glass dishes. On the average, sun protective lotions decreased the amount of UV transmissions from 55-87% as compared with the untreated dishes. At times sunscreens seemed to block out more UVA and sunblocks seemed to stop more UVB radiation. Testing was done from 1-5 pm on July 26, 27, 30, and 31, 2007.

DISCUSSION

It soon became clear that human error and the unreliability of the sun to shine consistently created variability of data. It does appear that higher SPF's do block more UVB rays for both sunscreens and sunblocks. UVA behaves very differently though. All of the products we used claimed to decrease the amounts of both UVA and UVB rays.

While the study did help answer our research question somewhat, it also created many questions for further study.

*How does the climate, i.e. humidity, temperature, etc. effect the UV transmissivity?

*Do clouds effect the amount of UV radiation that reach the earth's surface?

*Does the time of day make a difference in measuring UV radiation?

*How can we relate our findings with dishes to skin?

*Would precipitation affect UV radiation reaching the earth's surface?

*If we used two sets of equipment to measure UV at the same time, would they have the same readings?

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